

Patent Application
10/010,162

REMARKS

Claims 12-22 are pending in the application. Claims 12 and 22, the only independent claims, have been amended herein

Objection to the drawings

Paragraph 1 of the final Action indicates that the drawings received on 10/13/03 "are not acceptable" "because the lines and numbers defining the drawings are blurred and not clearly legible". Applicants respectfully request further clarification as to the specific drawings, lines and numbers that appear "blurred" as the drawings submitted appear to comply with all drawings requirements under 37 CFR 1.84.

The drawings are again submitted herewith – perhaps the drawings were previously blurred based on the previous facsimile transmission. Withdrawal of the objection to the drawings is respectfully requested.

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Section 102 and 103 rejections

Claims 12-14 17-20 and 22 were rejected under 35 USC 102(b) as being anticipated by US Patent 6,121,089A (Zeng et al.); Claims 12-20 and 22 were rejected under 35 USC 102(e) as being anticipated by US Patent 6,429,078B2 (Kubo); and Claim 21 was rejected under 35 USC 103(a) as being unpatentable over Kubo.

In view of the foregoing claim amendments and the following discussion, each of the rejections is respectfully traversed and reconsideration is requested.

Independent Claim 12 is directed to a method of forming a trench MOSFET including providing a semiconductor wafer of a first conductivity type, depositing an epitaxial layer of the first conductivity type over the wafer, the epitaxial layer having a lower majority carrier concentration than the wafer, forming a body region of a second conductivity type within an upper portion of the epitaxial layer, providing a patterned first masking material layer over the epitaxial layer, the patterned first masking material layer comprising a first aperture, depositing a second masking material layer over the first masking material layer, etching the second masking material layer until a second aperture is created in the second masking material layer within the first aperture, the second aperture being narrower than the first aperture, forming a trench in the epitaxial layer by etching the semiconductor wafer through the second aperture, forming an insulating layer lining at least a portion of the trench, forming a conductive region within the trench adjacent the insulating layer and forming a source region of the first conductivity type within an upper portion of the body region and adjacent the trench. Claim 12 further recites that a lateral thickness of said source region is independent of the measurement of the distance between the first and second apertures.

Each of independent Claims 12 and 22 has been amended herein to recite that the source region is formed subsequent to the step of forming a trench.

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In the method of forming power semiconductor devices of Zeng “source region dopants 124.... are implanted into the first face 112a” (col. 11, lines 41-43) and *then* “a reactive ion etching (RCE) step is then performed to define a plurality of trenches 130 in the drift region 114... these trenches 130 are self aligned to the centers of the body and source regions 122 and 126” (col. 11, lines 54-58).

Zeng does *not* teach or suggest a method of forming a trench MOSFET in which a source region is formed *subsequent* to the formation of the trench.

For at least the foregoing reason, Applicants respectfully submit that each of independent Claims 12 and 22, as amended herein, is patentable over Zeng and reconsideration is requested.

Kubo, directed to a method of manufacturing insulating-gate semiconductor device, does not teach or suggest a method of forming a trench MOSFET device that includes the step of “forming a source region of the first conductivity type within an upper portion of the body region and adjacent the trench”.

In Kubo, “body region 14” is formed by injecting boron dopants *into the portion of channel layer 4*” – in addition, “source region 15” is then formed in Kubo when “arsenic dopants are injected into the portion of the channel layer 4 exposed through the opening ... for making a source region 15 of N+ type” (col. 5, lines 35-41).

Source region 15 of Kubo is simply *not* formed “within an upper portion of body region 14”, but within a portion of channel layer 4.


For at least the foregoing reason, it is respectfully submitted that each of independent Claims 12 and 22, as previously presented, is patentable over Kubo and reconsideration is requested.

Dependent Claims 13-21 are believed to be clearly patentable for all of the reasons indicated above with respect to Claim 12, from which they depend, and even further distinguish over Zeng and Kubo by reciting additional limitations. Should the Examiner be of the view that an interview would expedite consideration of the application, request is made that the Examiner

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telephone the Applicants' attorney at (908) 518-7700 in order that any outstanding issues be resolved.

Respectfully submitted,



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I hereby certify that this document and any
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